



PORTABLE LASER PROJECTION SYSTEM WITH IN-PROCESS QUALITY CONTROL IMPROVES COMPOSITE STRUCTURES PRODUCTION

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Payoff

Built-in quality realized through Composite Manufacturing Process Control System (CMPCS) helps reduce composite structure inspection, rework and scrap costs, and dramatically improves product quality, resulting in lower overall acquisition costs. Continuing research and application of CMPCS-related systems could lead to additional savings in the Air Force, the Department of Defense (DoD) and commercial industry, in addition to generating important innovations in manufacturing technology. Aerospace industry members have purchased over 20 units.

Accomplishment

Scientists and engineers at the Air Force Research Laboratory's (AFRL's) Materials and Manufacturing Directorate (ML) contracted with Assembly Guidance Systems, Inc. and Bell Helicopter Textron, Inc. to develop a system that dramatically improves the process for fabricating aircraft composite structures. The CMPCS, developed under the Small Business Innovation Research (SBIR) program, reduces lay-up time, eliminates the need for lay-up templates, improves product quality, substantially lowers production costs and helps eliminate human error. Continued application of the new system could save the Air Force and private industry millions of dollars and lead to improvements in manufacturing processes over a wide spectrum of products and services. Combined savings projections already exceed \$600,000 annually.

Background

Almost all hand-laid composite parts are produced using templates to show the assembler where to place each component in the laminate. Template handling and deciphering time, in fact, often exceeds the time required for the actual inspection. CMPCS proof-of-concept was demonstrated during Phase I of a SBIR Program begun in 1996. Phase II under the SBIR later resulted in the successful development of the new system. CMPCS incorporates an overhead projection system and uses optical imaging to provide accurate laser patterns showing placement locations for the composite material and core. The system provides real time, automatic in-process verification and documentation of each ply of composite material while it is being laid up. CMPCS eliminates the non-value-adding costs of template fabrication, storage, retrieval, registration, deciphering, scribing, reworking and training. The system is portable, can be set up by one person in less than 15 minutes, and can function as either a complete, stand-alone system or can be integrated with other systems such as filament winders, automatic compaction systems or tape layers. Engineers at the National Aeronautics and Space Administration (NASA) have studied CMPCS for use in the X-33 reusable launch vehicle program. The Boeing Company and Sikorsky Helicopter have also shown interest in CMPCS. Other prospective applications include wiring harnesses, tube bending inspection and general aircraft assembly.